Increasing Student Engagement In Introductory Physics Hybrid Classes

Breanna Epperson*. Dr. Kent Price,
Department of Physics, Earth Science, and Space Systems Engineering, College of Science

Introduction:

Research* shows that interactive teaching techniques have learning gains above traditional lecture. These interactive teaching techniques are difficult to apply in an online or hybrid setting.

Goal:

Incorporate interactive teaching techniques in a hybrid setting.

Previously, Dr. Price would use discussion groups to incorporate peer instruction into his online classes. He measured an increase in conceptual learning in online sections, but a growth below his lecture growth.

We are trying to improve on his previous efforts.

Materials and Methods:

To increase the interaction online, we altered the discussion board requirements:

Before:

- Post a total of three times
- Post what they think the answer is and why
- Comment on another student's response.
- State whether they agree or disagree with the other student's answer choice and why.
- Post final answer
- Answer a closed question.

After:

- All points above.
- Answer an open question rather than a closed question to increase inquiry and conversation.

With this, students commit to an answer, then discuss to get the correct final answer.

Examples:

Fall 2020 Discussion Board

In the amusement park ride the Gravitron, riders stand on the edge of a circular platform facing the center of the platform, with their backs against the wall. The platform then rotates rapidly at a constant speed so that the riders feel pinned against the wall, and the floor is removed from under the riders' feet. What is the force that keeps the riders from falling down?

A. Gravity B. The Normal Force C. Centripetal Force D. Friction

The coefficient of static friction has not been overcome. If it had, the person would move in one direction or the other. So I chose friction.

Friction keeps them from falling down. The force of friction keeps the force of gravity from pulling them down.

Spring 2021 Discussion Board

Compare the directions of the induced current in the two images above. In other words, what are the differences between the directions of the induced currents? Note: The wire loop is moving in the direction of the arrow in each image.

The induced current for the first picture would have to be clockwise to oppose the change of the original that is counter clockwise. The induced current for the second picture would be the also be clockwise to oppose the original current that is counter clockwise. You determine this by using the right hand rule.

Now looking at answer I want to change my answer for the top picture and it would be clockwise for that induced field. I disagree with her bottom answer because it would have to be in a different direction than the top picture and due to the right hand rule. The bottom pictures answer would be zero and not be clockwise or counterclockwise due to the right hand rule.

Conclusion:

- Students had to create their own answer with justification rather than choose from a list. This increased the amount of explanation that the student gave and the feedback from other students as these students had their own initial thoughts.
- Increases the number of possible answers, making it harder to guess the correct response.
- Questions are more challenging when open ended.

Future Plans:

- Students often did not finish their conversations during class time, so they often did not state their final answers. This made it difficult to determine whether there was an increase in the number of correct final answers.
- To combat this, we could allow the students to continue their conversation outside of class and talk about the correct response in the next class.
- Allow us to obtain data on the effectiveness of the open questioning.

*Fagen, Adam, et al. "Peer Instruction: Results from a Range of Classrooms: The Physics Teacher: Vol 40, No 4." *AAPT: Physics Education*, 2002, aapt.scitation.org/doi/pdf/10.1119/1.1474140?class=pdf.